

## **I. Summary**

In response to an amendment to the National Defense Authorization Act for Fiscal Year 2002, the National Institute for Occupational Safety and Health has undertaken a study to evaluate the potential for residual radioactive and beryllium contamination at facilities that processed these materials in support of nuclear weapons production. This study evaluates whether significant residual contamination remained at atomic weapons employer or beryllium vendor facilities after such facilities had concluded work for the Department of Energy or its predecessor agencies. This is a paper study, based on a review of available documents. Although this study is not designed to determine whether these facilities pose a current, unrecognized occupational or public health threat, none of the documents reviewed indicates the existence of a current or unrecognized occupational or public health threat.

The initial evaluation consisted of a review of documentation from several sources, including information previously compiled by the Department of Energy (DOE) Office of Worker Advocacy. This study was based on the information posted on the Office of Worker Advocacy Website as of April 19, 2002. Changes made after that date are not reflected in this report.

The preliminary findings of this study rest upon evaluation criteria requiring clear evidence of effective facility decontamination before concluding that little potential for residual contamination exists for a particular facility. All of the 27 facilities listed as having the potential for significant residual radioactive contamination outside the listed periods are either currently being remediated, were remediated after the listed end date, or have been demolished. Two of the 32 facilities listed as having the potential for significant beryllium contamination have been remediated; no documentation of decontamination was found for 30 of these facilities. In many cases, these facilities are currently producing or using beryllium and any residual contamination related to nuclear weapons work may be indistinguishable from that resulting from other work. The preliminary findings of this study are briefly summarized below:

There are atomic weapons employer facilities and beryllium vendor facilities for which the potential for significant residual radiological and beryllium contamination exists outside of the time periods listed by the Department of Energy on the DOE Office of Worker Advocacy Website. In these cases, this contamination could have caused or substantially contributed to the cancer of a covered employee with cancer or a covered beryllium illness, as the case may be.

Of the 218 facilities evaluated for residual radioactive contamination:

- 74 (34%) have little potential for significant residual contamination outside of the listed period
- 27 (12%) have the potential for significant residual contamination outside of the listed period
- 117 (54%) warrant further investigation due to insufficient information to make an accurate determination

Of the 45 facilities evaluated for residual beryllium contamination:

- 5 (11%) have little potential for significant residual contamination outside of the listed period
- 32 (71%) have the potential for significant residual contamination outside of the listed period
- 8 (18%) warrant further investigation due to insufficient information to make an accurate determination.

In several cases, the facilities processed radioactive material or beryllium for commercial, non-DOE contracts in addition to that which was processed for weapons production. Sometimes the material processed for weapons production was only a small fraction of the material processed at a given facility. The residual contamination resulting from DOE production was indistinguishable from material processed for commercial purposes. In these cases, to conservatively err on the side of the energy employees, it was assumed that the contamination was the result of weapons production activities.

Additional research, possibly including site visits may be necessary to make a determination regarding residual contamination at many of the facilities included in this study. The final report with the conclusion of this study is due December 28, 2002.

## II. Introduction and Purpose

The Energy Employees Occupational Illness Compensation Program Act of 2000, Title 36 of Public Law 106-398, established a program to provide compensation to individuals who developed illnesses as a result of their employment in nuclear weapons production-related activities at certain facilities in which radioactive materials or beryllium was processed. The Department of Energy (DOE) was directed by Executive Order 13179 to publish in the *Federal Register* a list of facilities covered by the Act. On January 17, 2001, the DOE published a list of atomic weapons employers (AWE), Department of Energy (DOE) facilities, and beryllium vendors (BE), in the *Federal Register*; the list was revised on June 11, 2001, Vol. 66, No. 112 (FR Doc. 01-14583).

The Department of Energy Office of Worker Advocacy Website (<http://www.eh.doe.gov/advocacy>) provides a synopsis of the work performed at each facility, including a listing of time periods during which a facility conducted processing or production activities for the DOE or its predecessors.

In December 2001, the National Defense Authorization Act for Fiscal Year 2002 (P.L. 107-107) required the National Institute for Occupational Safety and Health (NIOSH) to carry out a study to investigate the following issues:

- 1) Whether significant contamination remained in any atomic weapons employer facility or facility of a beryllium vendor after such facility discontinued activities related to the production of nuclear weapons; and
- 2) Whether such contamination could have caused or substantially contributed to the cancer of a covered employee with cancer or a covered beryllium illness, as the case may be.

NIOSH was required to provide a progress report to Congress within six months of the date of enactment. The first six months of this study consisted primarily of an evaluation of documents pertaining to AWEs compiled by the DOE Office of Worker Advocacy. The documentation reviewed included thousands of pages of site-specific information collected by the Office of Worker Advocacy from a variety of sources. The quantity and quality of the information available for each site varied significantly. Examples of documents reviewed included radiological surveys, descriptions of production operations, contractual agreements, and interoffice correspondence. This documentation was reviewed to determine if a potential for significant residual radioactive or beryllium contamination existed at atomic weapons employer facilities or beryllium vendor facilities after such facilities discontinued activities related to the production of nuclear weapons and if so, whether or not such contamination could have caused or substantially contributed to the cancer of a covered employee with cancer or a covered beryllium illness.

If the documentation reviewed indicated that residual radioactive contamination was present outside of the listed periods, then the levels were compared to current radiation protection limits. If the contamination or radiation levels were determined to be in excess of those requiring

radiological controls, it was determined that this material could have caused or substantially contributed to the cancer of an employee. In the case of beryllium contamination, if there was no documented evidence that the beryllium areas had been decontaminated, it was determined that this material could have caused or substantially contributed to the beryllium illness of an employee. The level of residual beryllium contamination remaining was not included in the determination since beryllium sensitization can occur at very low levels of exposure.

As required by the amendment, this report is intended to describe the status of NIOSH's study through April 2002. Additional research, possibly including site visits, may be necessary to make a determination concerning residual contamination at many of the facilities included in this study. A final report is required by December 28, 2002.

Since the investigation involves the evaluation of potential radioactive contamination as well as beryllium contamination, the study was divided such that the required expertise could be devoted to the radiological facilities and the beryllium facilities. A summary of the findings for each facility evaluated for residual radiological contamination is provided as Appendices A-1 and A-2. A summary of the findings for each facility evaluated for residual beryllium contamination is provided as Appendices B-1 and B-2.

### **III. Further Investigation Approaches**

This progress report represents the findings resulting from an evaluation of a variety of facility-specific documents compiled by the DOE. Although the documents were sufficient to make a determination regarding the potential for residual beryllium or radioactive contamination at some facilities, additional research is necessary to make similar determinations at other facilities.

Additional research will be required for facilities for which the available documentation was insufficient to make a determination. This research may include, but is not limited to the following:

1) Search for and Review of Additional Documentation.

Additional site-specific documentation may exist in the Formerly Utilized Sites Remedial Action Program (FUSRAP) files, in files held by the Oak Ridge Associated Universities, in site reviews conducted by the DOE Health and Safety Laboratory and other sources. When available, the points of contact for individual facilities may also be identified and used to search for additional documentation.

2) On-site Inspections

Sites for which no additional documentation is available may be visited in an effort to make determinations. These visits may include interviews of operations personnel as well as the conduct of surveys for residual radiological and/or beryllium contamination.

3) Solicitation of Information from Interested Parties

As appropriate, NIOSH may solicit and collect information for review from other interested parties that may have documentation helpful in making site-specific determinations. NIOSH will also accept and review unsolicited information provided by interested parties.

Upon completion of this additional research, a final report will be submitted which will include, to the extent possible, a determination for each facility.

#### **IV. Residual Radioactivity Evaluation**

In the preliminary investigation, the primary sources of information used to evaluate each site were the individual facility files compiled by DOE Office of Worker Advocacy (EH-8). These files, organized by state and individual facility name, consisted of more than 30,000 pages of information. The information for any given facility was variable. Some of the files were voluminous (containing more than 1,000 pages), while others contained very little information other than a single entry. While this information was primarily collected to establish dates of covered employment, many of the facility files contained information relevant to characterizing radioactive contamination.

Another source of information used in this evaluation was the DOE publication “Linking Legacies” (DOE/EM-0319). This document provided background information on several sites, including process descriptions, and, in some cases, the amount of material processed. However, the publication was of limited use regarding dates of facility operations and potential for long-term facility contamination.

The final source of information used was the Army Corps of Engineers Website which contained information on FUSRAP. While this was of limited value for many sites, in some cases, it did provide additional facility descriptions and approximate dates that the facilities were remediated under FUSRAP. For many sites, however, it did not provide sufficient documentation to identify a date when contamination was fully removed and the site closed.

In all cases, the individual site recommendation is based on available information. Considerable professional judgement was used when making the determination on any single site, given the quantity and completeness of the information in the facility files. As more information is obtained on any of these sites, the recommendations in this report may need to be reevaluated.

During the evaluation of residual radioactive contamination, the following factors were considered:

- 1) radionuclides involved
- 2) quantity of radioactive material processed
- 3) physical form of the radioactive material processed (i.e., solid, liquid, or gas)
- 4) operations performed and their potential for radiation/radioactivity exposure
- 5) documented radiological control and monitoring programs in place during operations
- 6) documented decontamination of facilities

These factors were used to estimate the potential for radiation exposure both during operations and after production/processing had ceased. For example, a facility for which a thorough decontamination survey was documented was assumed to have little potential for residual contamination after the date of decontamination; a facility with a high potential for residual contamination during operations and no documented decontamination data was considered to have a high potential for residual contamination after operations had ceased.

Each site was assigned to one of the three following categories:

1. Documentation reviewed indicates that there is little potential for significant residual contamination outside the listed period.

A site was assigned to this category if the documentation available for a facility included one or more of the following characteristics:

- a) documentation indicating that the facility was decontaminated within the listed period
- b) facility had very little potential for residual contamination during actual operations
- c) facility is still in operation and the end date is listed as “present”

2. Documentation reviewed indicates there is a potential for significant residual contamination outside the listed period.

A site was assigned to this category if there was documentation indicating that radioactive material, in quantities or form which could have caused or substantially contributed to the cancer of a covered employee, was processed or present outside of the dates listed on the DOE Office of Worker Advocacy Website. This type of documentation often included FUSRAP surveys, conducted after Manhattan Engineering District (MED)/Atomic Energy Commission (AEC) operations were complete, which indicated the presence of residual radioactive contamination.

3. This site warrants further investigation.

A site was assigned to this category if the documentation available for review was not sufficient to determine that a facility had a reasonable potential for significant contamination. This category included the largest percentage of the reviewed sites. Many of the available files lacked sufficiently complete information to make a reasonable determination as to the presence of residual radioactive contamination. This indicates the need for a more comprehensive review of the facility to make a determination.

## **Results**

There were 74 of 218 AWE facilities that have little potential for significant residual contamination outside of the listed periods published on the DOE Office of Worker Advocacy Website as of April 19, 2002 (34% of the sites).

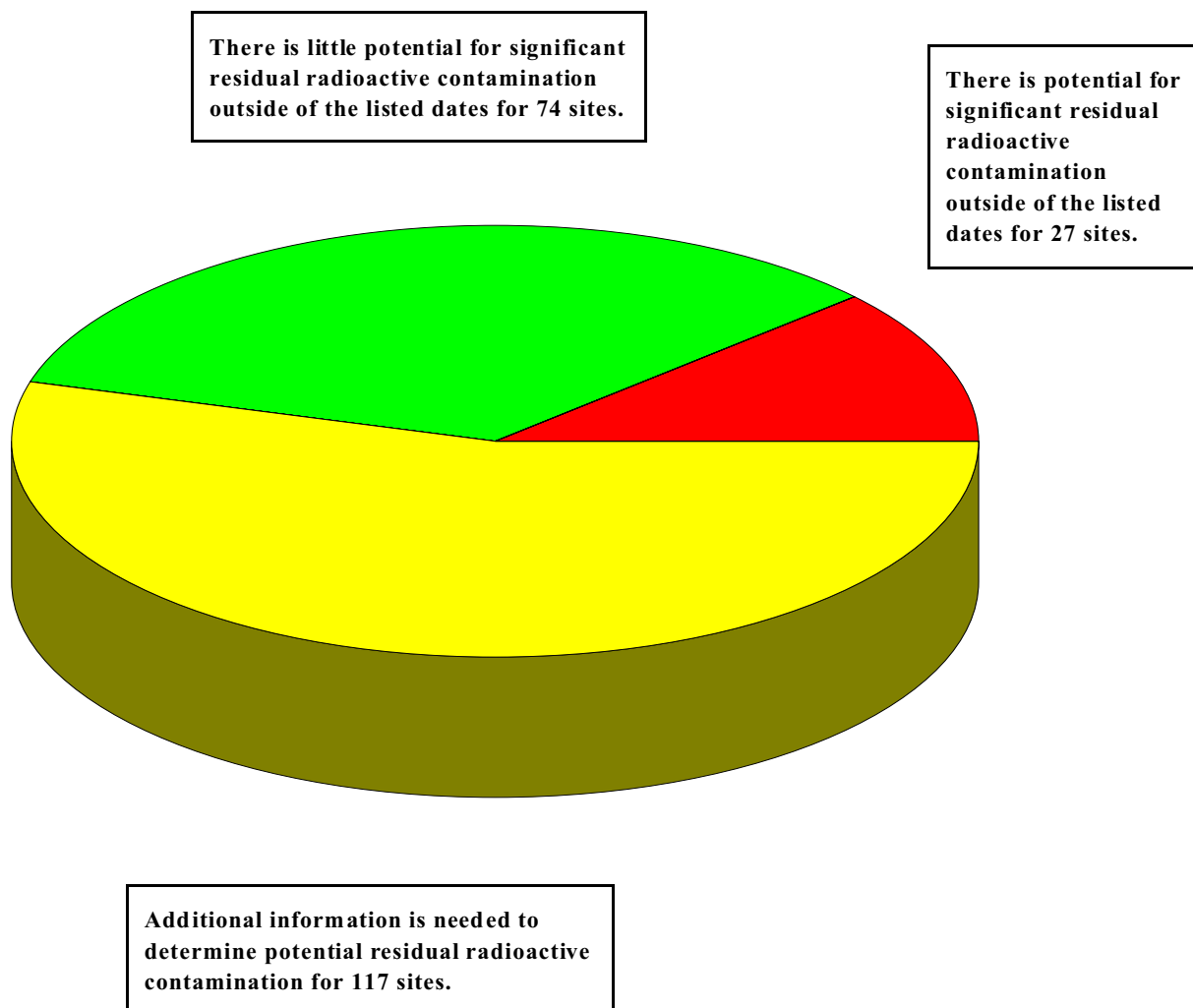
There were 27 facilities identified that have the potential for significant residual contamination outside of the listed periods (12% of the sites).

There were 117 facilities that warrant further investigation due to the unavailability of sufficient information to make a determination (54% of the sites).

A graphical representation of the results is presented in Figure 1. A complete summary of all the sites evaluated, with individual recommendations is provided in Appendix A-1. Individual facility evaluations, with expanded discussion on each facility, are provided in Appendix A-2.

### **Figure 1**

## Potential for Residual Radioactivity





## V. Residual Beryllium Contamination Evaluation

In the preliminary investigation, the primary sources of information used to evaluate each site were the individual facility files compiled by DOE Office of Worker Advocacy (EH-8). These files, organized by state and individual facility name, represented more than 10,000 pages of information. The information for any given facility was variable. Some of the files were voluminous (containing more than 1,000 pages), while others contained very little information other than a single entry.

In all cases, the individual site recommendation is based on the available information. Considerable professional judgement was used when making the determination on any single site, given the quantity and completeness of the information in the facility files. As more information is obtained on any of these sites, the recommendations in this report may need to be reevaluated.

During the evaluation of residual beryllium contamination, the following factors were considered:

- 1) if beryllium was actually handled at the site
- 2) if there was documented evidence of decontamination of the facility

These factors were used to estimate the potential for beryllium exposure both during operations and after production/processing had ceased. For example, a facility for which a thorough decontamination survey was documented was assumed to have little potential for residual beryllium contamination after the decontamination date; a facility without a documented decontamination was considered to have a high potential for residual beryllium contamination after operations had ceased.

Each site was assigned to one of three categories:

1. Documentation reviewed indicates that there is little potential for significant residual contamination outside the listed period.

A site was assigned to this category if the documentation available for a facility included one or more of the following characteristics:

- a) a documented decontamination and survey data
- b) facility had very little potential for residual contamination during actual operations
- c) facility is still in operation and the end date is listed as “present”

2. Documentation reviewed indicates there is a potential for significant residual contamination outside the listed period.

A site was assigned to this category if either of the following conditions existed:

- a) documentation was available indicating that beryllium was processed or present outside of the dates listed on the DOE Office of Worker Advocacy Website that could have caused or substantially contributed to the beryllium illness of a covered employee

- b) there was no documentation of a decontamination of the facility or area where beryllium was processed

3. This site warrants further investigation.

A site was assigned to this category if the documentation available for review was not sufficient to determine that a facility had a reasonable potential for significant contamination. This category included the largest percentage of the reviewed sites. Many of the available files lacked sufficiently complete information to make a reasonable determination as to the presence of residual beryllium contamination. This indicates the need for a more comprehensive review of the facility to make a determination.

## **Results**

There were 5 of 45 beryllium vendor facilities that have little potential for significant residual contamination outside of the listed periods (11% of the sites).

There were 32 facilities identified that have the potential for significant residual contamination outside of the listed periods (71% of the sites).

There were 8 facilities that warrant further investigation due to the unavailability of sufficient information to make a determination (18% of the sites).

A graphical representation of the results is presented in Figure 2.

A complete summary of all the sites evaluated, with individual recommendations is provided in Appendix B-1. Individual facility evaluations, with expanded discussion on each facility, are provided in Appendix B-2.

**Figure 2**

**Potential for Residual Beryllium Contamination**

